

COLLECTIVE TAGGING OF PLACES IN THE MULTI-USER VIRTUAL ENVIRONMENT OF SECOND LIFE

by
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Life is a multi-user virtual environment, i.e., a world made up of virtual places and avatars that move among and interact in those places. Thirty-one users of Second Life were surveyed about one place in which they are members: Terra's Nude Heaven, a virtual nude beach. The purpose of the survey was to determine what types of terms users would select if they could tag a particular place and how these terms correspond to the tags actually assigned by the owners of the place. The questionnaire data was also analyzed for difference in tag selection by gender, educational level, age, and country of residence.

The data indicate that keywords rated as most important by the users of a place differ considerably from the keywords selected by the owner of a place. The data, moreover, demonstrate that the choices of the study population remain consistent across groupings by gender, educational level, age or country of residence.

Headings:

Collective tagging – Multi-user Virtual Environments

Keywords – Multi-user Virtual Environments

Metadata – Multi-user Virtual Environments

Second Life – metadata

Surveys – Multi-user Virtual Environments

Introduction

In Neal Stephenson's 1992 science fiction, dystopian novel, *Snow Crash*, the author speculated on a metaverse populated by avatars who lived and loved in a multi-user virtual environment (MUVE). In this brave, new world the hero of the story was helped by an artificial intelligence program called the "Librarian." The Librarian daemon could "move through the nearly infinite stacks of information ... with the agility of a spider dancing across a vast web." (Stephenson, 1992, p. 100)

More than a decade later many of the characteristics of Stephenson's *Snow Crash* were purposely incorporated into the virtual world known as "Second Life," but the Librarian has yet to make an appearance. This paper attempts to examine why information seeking and retrieval is problematic in graphical virtual realities. It also looks at a specific community of users who spend time at a particular virtual place – Terra's Nude Heaven. Can the denizens of a virtual nude beach describe the place they love to frequent in a way that helps like-minded people discover it?

Conceptual Background and Research Questions

Second Life – An Overview

On June 23rd, 2003, the multi-user virtual environment (MUVE) known as Second Life logged in its first users. (Rymaszewski et al., 2007) In less than four years it has experienced exponential growth. As of early in the spring of 2007 more than five million

people have registered and at any specific moment between 30 and 40 thousand users are active inside the virtual world. What does it mean to be active inside a virtual world?

Before someone enters the virtual world of Second Life, he or she must first select an avatar. Simply put, an avatar is a surrogate for the physical body in the virtual environment. (Castronova, 2003) Before first logging into Second Life, the user selects from a few representative bodies, either male or female. Some of the possible bodies are not human, but resemble an anthropomorphized animal – a “furry,” or even a robot. The user then must select a name for this persona. The first name can be anything the user chooses, but the last name must be selected from a list supplied by Linden Lab, the owner of Second Life.

When the first-time user logs into Second Life, his or her avatar materializes on an orientation island. The newborn avatar must learn how to move and communicate in the virtual world. Rather than looking directly through the eyes of the avatar, the user viewpoint seems to hover a few feet behind and above the avatar’s head. This makes movement much easier since peripheral vision is non-existent. Communication is accomplished through typing in one of two modes. In chat mode whatever an avatar types at the keyboard is seen by other avatars who are within about 30 yards. While the avatar is typing in chat mode, his or her hands appear to be typing on an invisible keyboard suspended about waist high. This is a visual clue to other avatars that a message is being formed. The other mode of communication is instant messaging (IM). Avatars can click on the nametag that is suspended above the heads of other avatars and select “IM.” This

pops up a window that enables private communication with only that avatar. No other avatar in the vicinity can “hear” the message and the avatar’s hands do not make the typing motion.

Newly born avatars are referred to in Second Life as “newbies.” Newbies are easy to identify because they look like one of the default avatar types selected when first logging into SL. When newbies leave orientation island and venture out into other places, they immediately realize that avatars are infinitely customizable. Linden Labs supplies an appearance function that allows a user to alter the physical characteristics of their avatar.

The avatar lives and moves within the Second Life virtual environment. This environment is a matrix of thousands of servers that emulate physical real estate. Each server simulates 16,000 square meters of land. This land may be an island surrounded by water or be part of a collection of “sims” that form a continental mass.

Just as communication has different modes, so too avatar movement within the grid of servers is accomplished several different ways. An avatar can walk, fly or teleport from place to place. Walking is generally reserved for fine grain movement within a place and is generally necessary within the tight confines of most buildings. Faster movement is best done by flying. It is possible to fly seamlessly between the simulated lands of different servers in Second Life and is roughly analogous to browsing or surfing the web. To quickly go to a particular place teleportation is used. It is possible to find a place in

the Second Life search engine and instantly teleport there. This is an important way avatars discover places they may want to visit.

Information Seeking in Second Life

Despite being such a recent phenomenon Second Life has generated a great deal of media attention and some academic interest. Researchers have looked at the economic, educational and social implications of this virtual reality. For the purpose of this paper I will focus on the informational environment of Second Life – an area that has garnered little attention.

It is very telling that in the book, *second life: the official guide*, published by the company responsible for Second Life, Linden Labs, there is no mention of the search engine. The button for the search engine is located on the bottom toolbar of the Second Life application screen. The section of the official guide that explains the bottom toolbar skips over the search button as if it did not exist, yet the illustrations used in the book clearly show it. (Rymaszewski et al., 2007, p.28)

When I first logged into Second Life in December, 2006, I wanted to visit a building on some land leased to the University of North Carolina School of Information and Library Science (SILS). No combination of keywords entered into the search engine retrieved any information whatsoever about this place. It was totally invisible to the search engine. Only after receiving the grid coordinates from a professor familiar with the agreement to lease the virtual real estate was I able to find the land and its building. I intuitively knew

that the Second Life search engine must operate differently from search engines found on the internet like Google or Yahoo. It was only after talking to several landowners and gaining landowner rights for the SILS land in Second Life that I began to piece together why the search engine was unable to help me find the land.

Just as every avatar in Second Life has a profile, every virtual real estate lot has a profile.

See figure 1 for the profile of the SILS land.

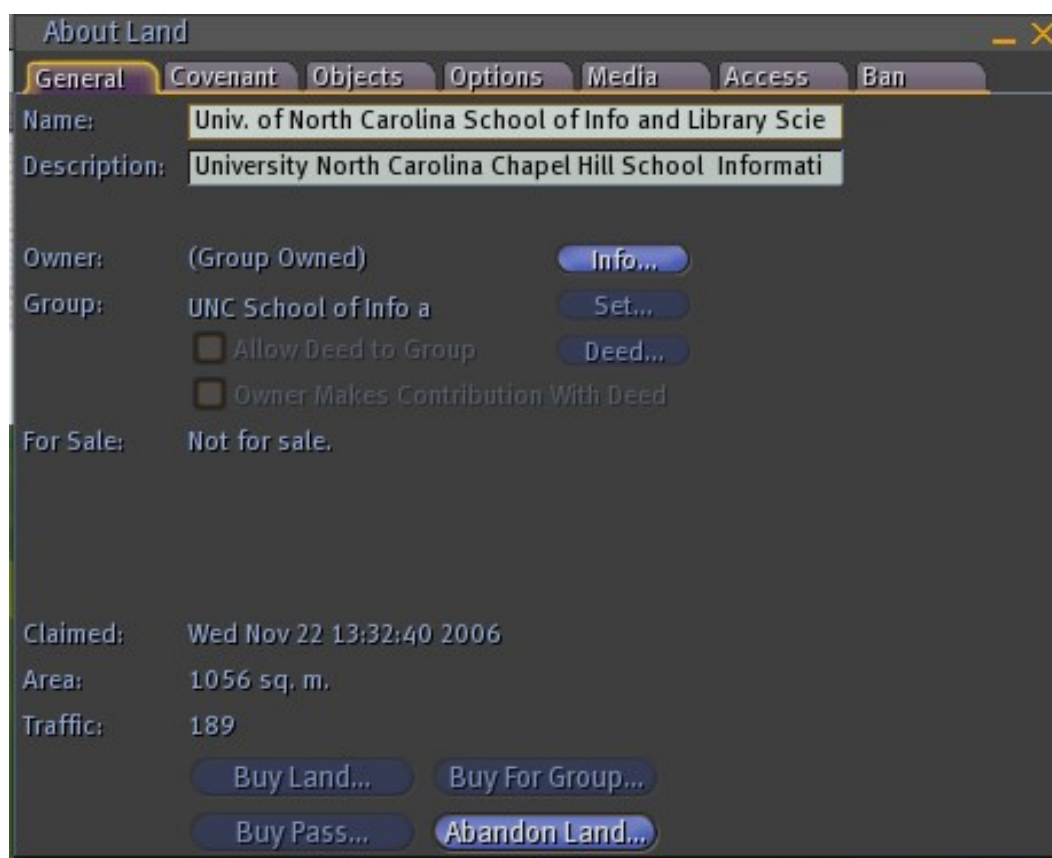


Figure 1. Second Life Land Profile

One hundred and twenty characters can be inserted in the “Description,-” field and the search engine will only retrieve using these keywords. And as if to add insult to injury,

Linden Labs charges the landowner \$30L¹ (about 12 cents) per month for these keywords. Imagine the internet if the only text a Google bot could crawl was restricted to a handful of keywords for which the creator of the website paid a monthly fee. The resource discovery environment is suddenly very narrow indeed. All of this emphasizes how vitally important the land keywords are in Second Life. This paper will look at the keywords placed in the land description by the owners of Terra's Nude Heaven and discover how users of that land might assign keywords based on their own experience of that place.

“Collective” Tagging

“Tagging” has come to connote user-created metadata, usually describing the subject of the page or site being tagged. Del.icio.us, Technorati and Flickr are just a few of the examples of web-based tagging systems which allow users to annotate an information resource. This resource may be a web page, a blog post, a photograph, a video, etc. (Marlow, Naaman, boyd, & Davis, 2006) The tagging process is generally done without the benefit of a classification system or taxonomy, and the resulting tags produce a flat namespace of sometimes messy, jumbled keywords. (Hammond, Hannay, Lund, & Scott, 2005) But there is semantic power in combining the tags of many users. These amateur-tagging systems can actually outperform and be less costly than professional categorization schemes. (Shirkey, 2005)

¹ Second Life has an economy of its own, in which Lindens are the currency. The current exchange rate is about 300 Lindens per U.S. dollar.

When tagging is done by a number of users in concert, it is termed “collaborative tagging” (Golder & Huberman, 2005) and the resulting collection of tags are called a folksonomy. (Mathes, 2004) As in other folksonomies, the keywords included in a Second Life land profile are in a flat namespace, i.e. with no hierarchy and no parent-child or broader-narrower relationships between the keywords. This is an important feature of a folksonomy. While folksonomies do not use controlled vocabularies and are plagued by ambiguity and lack of synonym control, they do work surprisingly well. (Mathes, 2004) Research in tagging has shown that it can be used for resource discovery and that collective tagging accurately conveys semantic meaning. (Robbins, 2006)

The metadata included in the Second Life land profile is created by the owner of the land. However, as often as not, the owner simply buys the developed land and does not create a description of it. One way to make money in Second Life is to buy undeveloped virtual property and improve it with terraforming, landscaping, and buildings. But until it is ready to be re-sold, there is no incentive for the owner to pay Linden Lab for the privilege of creating a description of the land.

When owners do create descriptions, they may be just a list of the objects on the land. However, I would contend that the activities that occur on the land and the people who visit the land are a large part of what the land is “about.” Therefore, an owner probably looks at the objects, activities, and people who come to the land to derive the keywords entered into the land’s description. Whether this hypothesis about the way in which owners create metadata or whether owners are very good at creating metadata for their

Second Life land are areas of research that can be explored later. For this paper I wish to see if the users of a particular place can collectively determine the best keywords for describing it fairly and accurately.

Are the land description keywords in Second Life an example of folksonomy or collaborative tagging? Not really. Only the owner can enter data into the land profile. Perhaps the owners may consult with other avatars, but they are under no obligation to do so. And the 120-character limitation on land metadata makes contributions by many users impractical. What is needed is some polling mechanism whereby the avatars can collectively voice their opinions on which keywords best describe the place they inhabit.

Research Questions

The current study is an attempt to explore the potential for members of a particular place in Second Life to collectively tag it. Specifically, it asks two research questions:

1. *If users of a place in Second Life could tag that place, what types of terms would they select?*
2. *How do these terms correspond to the owner's tags actually assigned?*

Since some demographic information such as age, educational level, country of residence, etc will be gathered, another question is:

3. *Are there significant differences between subsets of the users in their choice of keywords?*

A fourth and final question is related to resource discovery behavior:

4. How do users of a place in Second Life find information about the virtual environment?

Methods

Selection of Terra's Nude Heaven as a Study Site

Serendipity played a very large part in the selection of Terra's Nude Heaven for this study. I wanted to study a community of avatars who possessed some social cohesion. This was not an easy thing to find. Any visitor to Second Life soon notices that avatars tend to clump together. Large sections of land will be essentially empty with users tightly packed into a relatively small area. These clusters were usually associated with one of three activities – gambling, sex or shopping.

Unfortunately, these hubs of activity were not especially social. Lines of avatars at slot machines are no more sociable than corresponding people pulling the lever at real world casinos. One can be elbow to elbow with avatars at a popular store in Second Life and feel completely isolated.

I met one of the owners of Terra's Nude Heaven while shopping for a musical instrument. This chance encounter led to an invitation to visit her land. I found that Terra's Nude Heaven in its brief six-month existence had become one of the more popular beaches in Second Life. Contrary to its moniker, many, if not most avatars, wear swimsuits or other beach attire, so it truly is a clothing optional beach. The avatars there were almost

without exception friendly and quick to start a conversation. Thus, it seemed like an appropriate place within Second Life for a study of metadata use and resource discovery.

Keywords Describing Terra's Nude Heaven

My core concern was to find a way to gather keywords from the members of Terra's Nude Heaven that could add semantic value to the place. The following fourteen descriptive keywords were already a part of the land profile (spaces added for readability):

NEWBIE FRIENDLY NUDE BEACH SEX GARDEN SHOPPING LADIES TOYS
DANCE ROMANCE SKYDIVE CLOTHING OPTIONAL PENIS

These keywords were added by one of the owners to make the place visible to the Second Life search engine. The owners must pay Lindens Lab \$30L (about 12 cents) per month for this service. Only 120 characters are allowed.

The keywords easily lend themselves to being organized into nouns, verbs and adjectives, or objects, activities, and descriptors. The owners' keyword list then breaks down into:

Objects	Activities	Descriptors
Beach	sex	newbie
Garden	shopping	friendly
Toys	romance	clothing optional
Penis	skydive	nude
Ladies		

Breaking the keywords into these categories also facilitated the discovery of new keywords for this study. My avatar walked around Terra's Nude Heaven and took note of every object there, as well as observing the activities that were happening. Arriving at the descriptors was more subjective, but I was helped by the avatars' own words. For example, I included the keyword "safe" to the list after hearing several avatars using the

phrase “Be safe” as a parting greeting. After carefully observing Terra’s Nude Heaven for several days, the following additional keywords were identified as the basis of my questionnaire:

Objects	Activities	Descriptors
Tub	Dance	Sexy
Bar	Recline	erotic
Shower	Sunbathe	Romantic
Parachute	Wrestle	BDSM
Float	Cuddle	Naturist
Lounge	Meditate	Stimulating
Drum	Drum	Safe
Pose-balls	Drink	Spontaneous
Hookah	Date	Humorous
Ducks	Music	Funny
Pond	Massage	Loving
Shoppe	Games	Relaxing
	Party	Arousing
	Conversation	Heavenly
	Shower	
	Kiss	

In a questionnaire distributed to the avatars that are members of Terra’s Nude Heaven, they were asked to rate each of these words (both the owner-assigned keywords and those I generated) on the following scale:

- 5 = very important
- 4 = somewhat important
- 3 = neutral
- 2 = not very important
- 1 = not at all important

In addition to the keyword generation section of the questionnaire, some demographic data were gathered as well as some information about avatar information seeking behavior and other behavior at Terra’s Nude Heaven.

As little real life information as possible was gathered -- age, educational level, and country of residence. All of the remaining information only applied to the avatar’s

experience in the virtual world. An analysis of the profiles of all the members of the group indicated that many avatars prefer to keep their real life quite separate from their second life. (McKeon & Wyche, 2005) For example, of the 31 members who filled out and submitted questionnaires, only five said that they include a real life photo in their Second Life profile.

Data Collection Procedures

The questionnaire (see Appendix A) was sent to all 184 avatars belonging to the “-Terra’s Nude Heaven-” group as of January 15, 2007. I first copied the questionnaire from Microsoft Word to a plain text file. Then I copied the text into a buffer and pasted the text into a Second Life notecard. Notecards are the mechanism for sharing textual information in Second Life since it is not possible to email avatars unless they divulge their email address. To email them directly is considered a serious breach of avatarian anonymity.

The notecard was addressed to each avatar with their full name and dragged from my inventory onto the right-hand side of their profile. If the avatar is online he or she receives the notecard immediately. If the avatar is not online, the notecard is saved and is transferred to the avatar when he or she next logs in.

The procedure to return the notecard to me is just the reverse. The avatar after filling out the questionnaire simply drags the notecard from his or her inventory to my profile. I will receive the notecard immediately if online or when I next log into Second Life.

Avatars were paid \$100L (approximately 35 cents) for filling out the questionnaire. The payment may seem trivial but \$100L has considerable value in Second Life. A common way of earning money in Second Life is referred to as “camping.” Much of the land in Second Life is empty. Club owners or storeowners know that clusters of avatars attract other avatars. These commercial enterprises pay avatars approximately \$5L for simply sitting in a chair in their establishment for 20 minutes. It takes many hours of “camping” for an avatar to earn \$100L.

The distribution mechanism is somewhat time-consuming, taking approximately three minutes for each questionnaire. This proved to be a surprisingly fortunate characteristic. After receiving Institutional Review Board (IRB) approval for this study, I initially sent out only 20 questionnaires, planning to send the remaining ones the next day. The following day when I logged in, I received a group notice from one of the owners of Terra’s Nude Heaven:

“Hi if you have received a survey from Uskala (my avatar’s first name) please disregard it til further notice, sorry for any inconvenience it may have caused .thank you [first name of owner]”

My plan to distribute more questionnaires was instantly put on hold. I immediately contacted the owner via instant messaging and asked her why the group notice was sent. She replied that one of the members of the group thought the questions were “too personal” and was concerned that I knew the avatar’s name.

Upon reflection, I think an analogous situation in real life would be a member of a nude resort receiving a letter in the mail from a person they did not know asking about their activities at the nude resort. The member of the nude resort would probably be upset that the owner gave someone his or her address. In Second Life an avatar's name is roughly equivalent to an address since anyone can send a message to an avatar if his or her name is known.

Privacy in real life and in second life is not the same. One major difference is that group membership lists are freely available to any resident of Second Life. The concerned avatar thought the owner gave me his or her name, but that was not the case.

I requested a meeting with all three owners of Terra's Nude Heaven to discuss this issue. I explained to them that I was operating under very strict IRB guidelines and would be in serious trouble if I used the questionnaire information to stalk any of the members. A few days later one of the owners sent out the following group notice explaining the IRB safeguards and asking the members to fill out the questionnaire if they desired:

"Uskala Hidayat, who is a member of "Terra's Nude Heaven," is conducting research in Second Life. His survey is entirely voluntary. Uskala did not receive a list of the members of "Terra's Nude Heaven" from me or the other owners. That information is freely available to any resident. Uskala is being supervised and can get into serious

trouble if the information is used to "stalk" members. If you are interested in helping Uskala and earning some lindens please consider filling out his survey."

This message seemed to clear the road for the full distribution, which was accomplished in the next several hours.

More than ten days later only 18 questionnaires were returned to me. This represented slightly less than 10% of the total membership, but it is not clear how much of the active membership it represented. Linden Labs estimates that only 10% of the users who first log in on a given day are still active 30 days later. But membership is offered to avatars who visit Terra's Nude Heaven only after they have shown themselves to be sociable and well behaved. The retention rate for members of Terra's Nude Heaven should be higher than 10%. I questioned one of the owners about the history of their recruitment of members. She revealed that when Terra's was first starting out, "we took what we got," i.e., membership was offered to every avatar who visited.

It is very probable that 18 questionnaires represent much more than 10% of the active members, but in order to secure more responses, I decided to modify the protocol. If I spent several days at Terra's Nude Heaven, I would be able to personally ask avatars to fill out the questionnaire. I was able to secure IRB approval for this change in protocol. This personal appeal proved to be very effective.

Over a period of ten days, I personally reminded 28 avatars about the questionnaire (see the text of the initial reminder in Appendix B). Of those reminded, 13 returned completed instruments. The avatars who responded gave various reasons for originally not filling out the questionnaire. Many had simply forgotten that they had received the questionnaires. The questionnaire may have been received while they were busy with some other activity. Once buried in their inventory, it becomes all too easy to forget or misplace. The fact that nearly half of the reminded avatars returned completed questionnaires demonstrates how avatars are imbued with human presence. Receiving a text message is inherently impersonal, but receiving that same information from the hand of an avatar who has greeted the user and established a human connection is far from impersonal.

Another mechanism that was used during the solicitation phase was avatar “radar.” “Radar” is a script that displays the names of all avatars within a few hundred meters. Since avatars can teleport into any part of Terra’s Nude Heaven, it was important to have some way of knowing who was in the vicinity. My avatar sat in a beach chair in one corner of Terra’s Nude Heaven and observed the avatar “radar.” I would periodically check the radar’s listing against a list of members who did not return a questionnaire. When such an avatar appeared, I could leave my beach chair and seek him or her out. This was a much more effective recruiting strategy than constantly prowling the beach.

Results

The four research questions this paper attempts to answer are:

- If users of a place in Second Life could tag that place, what types of terms would they select?
- Do these tags differ by gender, age, educational level, or country of residence?
- How do these terms correspond to the owner's tags actually assigned?
- How do users of a place in Second Life find information about the virtual environment?

After describing the characteristics of the respondents, the results will be reported in terms of these research questions.

User Characteristics

All together, 31 users of Terra's Nude Heaven completed the questionnaire. Women comprised 58% and men 42% of the users who filled out and submitted questionnaires. This is exactly a mirror image of gender usage for all of Second Life where women comprise 42% of the active residents. (Linden Lab, 2007) The age groups contained within the users of Terra's Nude Heaven (see Table 1) could be separated into two groups of roughly the same size. Just over half (55%) of the users who filled out and submitted questionnaires were 37 years of age and below with 45% 38 years of age and above.

Table 1: Real Life Age of Respondents

Age Group	Frequency	Percent
18-22	2	6.5%
23-27	3	9.7%
28-32	6	19.4%
33-37	6	19.4%
38-44	3	9.7%
45-55	10	32.3%
>55	1	3.2%

Another grouping that was examined was educational level. Table 2 shows that roughly half of the users have completed college or graduate school.

Table 2: Real Life Educational Level of Respondents

Educational Level	Frequency	Percent
High school	8	25.8%
2 year Associate's degree	8	25.8%
4 year Bachelor's degree	8	25.8%
Graduate School	7	22.6%

One final grouping was analyzed for population consistency – country of residence. An examination of Table 3 shows that almost three-quarters (74%) of the respondents are native speakers of English. This is much more than Linden Labs reports for all active residents of Second Life. (Linden Lab, 2007) The respondents to this questionnaire can be separated into those from the United States (58%) and those who reside outside the United States (42%).

Table 3: Country of Residence of Respondents

Country of Residence	Second Life	Terra's Nude Heaven
United States	31%	58%
United Kingdom	8%	10%
Netherlands	7%	6%
Israel	0.3%	6%
Germany	10%	3%
Australia	1.5%	3%
Sweden	1.0%	3%
Denmark	0.9%	3%
New Zealand	0.2%	3%
South Korea	0.1%	3%

The owners of Terra's Nude Heaven include 14 keywords in their land profile description. 42 more keywords were added to the list, based on my experience with Terra's Nude Heaven. The members of the Terra's Nude Heaven group who filled out and submitted the questionnaire rated, on a five-point scale, the average importance of the entire set of keywords. The mean importance ratings are reported in Tables 4 – 6. Those marked with an asterisk were originally assigned by the owners.

Table 4: Descriptive Statistics for Object Keywords

Keyword	Mean	S.D.	Min	Max
Beach*	4.9	0.5	2	5
Bar	3.9	0.9	2	5
Lounge	3.8	1.2	1	5
Parachute	3.8	1.2	1	5
Pose-balls	3.7	1.3	1	5
Float	3.6	1.1	1	5
Ladies*	3.6	1.5	1	5
Garden*	3.6	1.2	1	5
Drum	2.9	1.2	1	5
Shoppe	2.9	1.4	1	5
Toys*	2.9	1.3	1	5
Tub	2.8	1.3	1	5
Shower	2.7	1.2	1	5
Penis*	2.6	1.2	1	5
Hookah	2.5	1.3	1	5
Pond	2.1	1.3	1	5
Ducks	2.0	1.2	1	5

Note: Those keywords marked with an asterisk (*) indicate those that were originally assigned by the Terra's Nude Heaven owners.

Table 5: Descriptive Statistics for Activity Keywords

Keyword	Mean	S.D.	Min	Max
Conversation	4.8	0.5	3	5
Dance*	4.5	0.8	2	5
Sunbathe	4.2	1.0	1	5
Party	4.2	0.9	1	5
Music	4.0	1.3	1	5
Cuddle	3.8	1.1	1	5
Meditate	3.7	1.1	1	5
Skydive*	3.7	1.4	1	5
Recline	3.6	1.2	1	5
Sex*	3.5	1.2	1	5
Kiss	3.5	1.3	1	5
Date	3.4	1.3	1	5
Massage	3.3	1.1	1	5
Games	3.2	1.1	1	5
Drink	3.1	1.3	1	5
Shopping*	3.0	1.3	1	5
Wrestle	2.9	1.2	1	5
Shower	2.9	1.2	1	5
Drum	2.9	1.3	1	5

Note: Those keywords marked with an asterisk (*) indicate those that were originally assigned by the Terra's Nude Heaven owners.

Table 6: Descriptive Statistics of Descriptors

Keyword	Mean	S.D.	Min	Max
Friendly*	4.8	0.6	2	5
Sexy	4.2	0.9	1	5
Nude*	4.2	1.1	1	5
Erotic	3.6	1.1	1	5
Adventurous	3.7	1.1	1	5
Romance*	3.9	1.1	1	5
BDSM	2.1	1.0	1	4
Clothing-optional*	4.6	0.7	3	5
Naturist	4.2	1.0	1	5
Stimulating	3.7	1.2	1	5
Fun	4.7	0.7	2	5
Connecting	3.8	1.2	1	5
Safe	4.2	1.0	1	5
Spontaneous	3.8	1.2	1	5
Humorous	3.9	1.2	1	5
Funny	3.9	1.1	1	5
Loving	3.8	1.1	1	5
Relaxing	4.6	0.6	3	5
Arousing	3.6	1.3	1	5
Heavenly	3.1	1.3	1	5
Newbie*	3.1	1.4	1	5

Note: Those keywords marked with an asterisk (*) indicate those that were originally assigned by the Terra's Nude Heaven owners.

Of the Object Keywords, one (Beach) is among the most important overall (i.e., had a mean rating of 4.0 or higher). Of the Activity Keywords, five are among the most important: Conversation, Dance, Sunbathe, Party, and Music. Of the Descriptors, eight are among the most important: Friendly, Fun, Relaxing, Clothing-optional, Sexy, Nude, Naturist, and Safe. Of all the keywords rated as very important, only four were originally assigned by the owners: Beach, Dance, Friendly, and Nude.

Another research question is whether there are significant differences between demographic groups in the selection of keywords. One obvious area to look for such differences is gender. Based on t test results, the data indicate that except for two keywords the choices of men and women are consistent. Men and women differed

($p < 0.05$) on their ratings of the importance of the keywords “shopping” (mean for men = 2.3; women = 3.4) and “romance.” (mean for men = 3.3; women = 4.3)

When the population was divided into those who had a four-year degree or more and those who did not, t test results indicated that the ratings of only two words are statistically significantly different ($P < 0.05$) different between the two groups – “shopping” (mean for less educated = 3.5; more educated = 2.4) and “shoppe.” (mean for less educated = 3.4; more educated = 2.3). While these two keywords are not synonymous, they are closely related.

Based on t test results, only one word, “heavenly,” (mean for younger = 3.7; older = 2.6) is statistically significantly different between the younger (< 38 years of age) and older (> 37 years of age) groupings. Again the different age groups appear to be consistent. Finally, the tags assigned by those from the U.S. were compared with those assigned by respondents residing outside the U.S. Based on t test results, the keyword importance ratings of these two groups were not statistically significantly different ($p < 0.05$).

An additional research question asked how users of Terra’s Nude Heaven locate information in Second Life. Examination of the statistics contained in Table 7 shows that the most important information retrieval process in Second Life is the search engine, but almost equally important are the relationships between avatars. Avatars in this study had on average 44 friends. When an avatar is “friended” it means that the user will be notified

when the friend logs into Second Life, and it also allows the user to “teleport” the avatar to his or her location. A friend can also be communicated with more easily as well.

Table 7: Information Seeking Behavior of Respondents

Information source	Number responding “yes”	Percent responding “yes”
Asking “friends”	29	93%
Search engine	28	90%
Asking avatars	27	86%
Notecards	20	66%
Overheard chat	15	48%
Outside information	15	48%
SL blogs or newspapers	13	41%
Mentors	1	3%
Greeters	1	3%

Note: Percentages total more than 100% because each participant could select multiple responses.

Discussion

Clearly the Terra’s Nude Heaven community agrees with the owners on the importance of some of the keywords used in the place’s metadata, but just as clearly, some of the words are not considered that important. Using the descriptive statistics contained in Tables 4 - 6, a different list of 14 keywords emerges, shown in Table 8.

Table 8: Keywords Rated Most Important by Study Participants

Objects		Activities		Descriptors	
Beach	4.9	Conversation	4.8	Friendly	4.8
		Dance	4.5	Fun	4.7
		Sunbathe	4.2	Clothing Optional	4.6
		Party	4.2	Relaxing	4.6
		Music	4.0	Nude	4.2
				Sexy	4.2
				Naturist	4.2
				Safe	4.2

Only one third of the owners' keywords are included in the 14 most important words to the users of Terra's Nude Heaven. Moreover, four of the owners' keywords are regarded as neutral or not very important. The word "sex" in the owners' list is very similar to the word "sexy" in the users' list, but the words are not synonymous. Also notice that many of the words in the users' list are "descriptor" keywords rather than "objects" or "activities." In general, users rate the "descriptor" keywords as more important than the "object" or "activity" keywords. The owners placed more object keywords in their own metadata. The inclusion of the words "penis, toys, and shoppe" was probably done to advertise items for sale in the vending area.

How do avatars describe Terra's Nude Heaven? Based on the data gathered, Terra's Nude Heaven is a relaxing beach where they can meet, converse, and have fun with other friendly avatars in a safe, yet sexy, atmosphere; and feel comfortable if they choose not to wear swimwear. Do the keywords placed in the land profile by the owners of Terra's Nude Heaven inform users of Second Life that such a place exists? Based on my analysis of the data, they do a relatively poor job of describing Terra's Nude Heaven.

The restriction of search engine metadata to 120 characters makes an adequate description of place difficult to begin with, but within that narrow scope is it possible to describe what a place in Second Life is about? This is not an easy task. Describing the "aboutness" of place in Second Life involves much more than harvesting the names of the objects that make up the place. Any beach can have mud wrestling, hot tubs, bars, etc. It is the experience of avatars in a place that creates the "aboutness" of the place. The

collective tagging wisdom of the avatars who filled out and submitted questionnaires proved to be very consistent and coherent. Regardless of gender, educational level, country of residence, or age, the active users of Terra's Nude Heaven spoke with one voice and identified those qualities that attracted them to a place and cause them to remain involved with that place. The 14 keywords (95 characters vs. 92 characters from the owners) they rated as most important give a surprisingly accurate picture of Terra's Nude Heaven.

What does the handful of words that proved to be significantly different between groups tell us about the users of Terra's Nude Heaven? One of the keywords that did have a different importance rating between groups is "shopping." Women and less educated users placed more importance on this word than men and more highly-educated users. This may be because of the "inherently social nature of shopping." (Hemp, 2006) Even though the groups rated the importance of this keyword differently, no group rated it as very important (i.e., above 4.0).

Future Research

For the sake of generalizability, repeating this study at other places in Second Life would be important. Will collective tagging accuracy be found with other groups of users closely associated with a particular piece of land? Other multi-user virtual environments exist, such as There, ActiveWorlds, and Neverwinter Nights. This research could be expanded into the various massive multi-user online role-playing games similar to World

of Warcraft. If other MUVES have a similar search engine and metadata scheme, will collective tagging prove accurate in that environment as well?

Of course, it would also be very interesting to do a longitudinal study of Terra's Nude Heaven. If the owners used the keywords identified as important by the users, would attendance increase and would the avatars coming to Terra's Nude Heaven be more compatible with the existing community? The owners must regularly patrol the beach to prevent explicit sexual activity from occurring anywhere except the designated skybox. If the behavioral expectations could be included in the place description would there be as much need for such vigilance?

The difficulty I encountered during the initial distribution of the questionnaires indicates that some avatars are unaware of who has access to information about them. Avatarian anonymity does not appear to mitigate this concern. Users become so invested in their avatars that real life identities are seen as beside the point. If information makes their life in Second Life more stressful or psychologically dangerous, they are upset if the information is readily accessible. As more research is conducted in MUVES, these concerns will need to be taken into account.

In summary this research demonstrates that users of a particular place in Second Life can collectively create metadata that reflect their experience of that virtual place. It also shows that such a population of users is consistent in their assessment of the relative importance of particular keywords, over gender, educational, age, and country of

residence divisions. Finally it shows that despite its limitations avatars do use the Second Life search engine for information seeking, but supplement that source with knowledge gained from personal relationships. There are, however, many questions left unanswered in this rapidly expanding, exploding world of Second Life. Just a few of them are:

- How do owners in Second Life decide which keywords to include in their land profile?
- If Lindens Lab allowed twice as much metadata to be included in the land profile, would places be described twice as well?
- Is the \$30L per month charge for metadata a barrier to resource discovery in Second Life? Does it make sense for Linden Labs to tax information?
- How many landowners actually include metadata about their land? Are there reasons they may choose not to?
- Many avatars use their in-world social networks to gain information. How do avatars remember this information? If it is recorded, how?
- Do the libraries in Second Life have a role in facilitating information discovery, analogous to referral services in real life libraries? How could this be done?

Second Life is a rich environment for research in information science, but the information scientist will need all of his or her ingenuity to adequately suss out the semantic secrets of this multi-user virtual environment.

References

- Castronova, E. (2003). Theory of the avatar. CESifo Working Paper Series. No. 863. Retrieved 08 March, 2007, from <http://ssrn.com/abstract=385103>.
- Golder, S., & Huberman, B. (2006). Usage patterns of collaborative tagging systems. *Journal of Information Science*, 32(2), 198–208.
- Hammond, T., Hannay, T., Lund, B., & Scott, J. (2005). Social bookmarking tools (I): A general review [Electronic Version]. *D-Lib Magazine*, 11. Retrieved 17 March, 2007, from <http://www.dlib.org/dlib/april05/hammond/04hammond.html>.
- Hemp, P. (2006). Avatar-based marketing. *Harvard Business Review*, 84(6), 48-57.
- Linden Lab. (2007). Second Life Virtual Economy Key Metrics (BETA). Retrieved 14 March, 2007, from http://secondlife.com/whatis/economy_stats.php.
- McKeon, M., & Wyche, S. (2005). Life across boundaries: Design, identity, and gender in SL. Retrieved 17 March, 2007, from <http://www.mattmckeeon.com/portfolio/second-life.pdf>.
- Marlow, C. Naaman, M. Boyd, D. & Davis, M. (2006). HT06, tagging paper, taxonomy, Flickr, academic article, toread . Proceedings of the Conference on Hypertext and Hypermedia, 31-40. New York: ACM Press. Retrieved 10 March, 2007, from <http://alumni.media.mit.edu/~cameron/cv/pubs/2006-ht06-tagging-paper>, <http://doi.acm.org/10.1145/1149941.1149949>.
- Mathes, A. (2004). Folksonomies - cooperative classification and communication through shared metadata. Retrieved 17 March, 2007, from <http://www.adammathes.com/academic/computer-mediated-communication/folksonomies.html>.
- Robbins, S. (2006). Tagging the collective: Tagging and social information literacy. Paper presented at the Georgia Conference on Information Literacy, October 2006. Retrieved 12 March, 2007, from <http://home.intellagirl.com/taggingpresentation.ppt>.
- Rynaszewski, M., Au, W.J., Wallace, M., Winters, C., Ondrejka, C., & Batstone-Cunningham, B. (2007). *Second Life: The Official Guide*. Hoboken, New Jersey: John Wiley & Sons, Inc.

Shirky, C. (2005b). Ontology is overrated: Categories, links, and tags. Retrieved 17 March, 2007, from http://www.shirky.com/writings/ontology_overrated.html.

Stephenson, N. (1992). *Snow Crash*. New York: Bantam Books.

Appendix A: Questionnaire

Hi [avatar's name],

My name is Arthur Taylor (SL name, Uskala Hidayat,) and in RL I am a graduate student in Information Science at the University of North Carolina at Chapel Hill. I am conducting a research project on community generated descriptive keywords in Second Life. You have received this survey because you are one of the 188 members of "Terra's Nude Heaven." Terra Cheeky, one of the owners of "Terra's Nude Heaven and Beach," have given me permission to conduct this research with the members of the group. Your participation is voluntary; you don't have to participate if you don't want to. It will take you approximately 5-10 minutes to complete the questionnaire. You will be paid \$100L if you do complete this questionnaire and return it to me.

The purpose of this research is to determine if a Second Life group can come up with keywords that describe a place in SL. These keywords are used by most SL avatars to find places they are interested in visiting. It is my hope that the keywords produced by users of a place will accurately and appropriately describe the place.

All of the data gathered will only be used in the aggregate. Individual avatar names will never be mentioned. The anonymity and privacy of your avatar will be respected. I will be the only person who will see your answers to the questions below. If you have any questions, you may contact me through Second Life or by email (uskala@email.unc.edu), or you may contact my advisor, Barbara Wildemuth, at wildem@ils.unc.edu.

All research on human volunteers is reviewed by a university committee that works to protect your rights and welfare. If you have questions or concerns about your rights as a research subject you may contact, anonymously if you wish, the UNC Institutional Review Board at 919-966-3113 or by email to IRB_subjects@unc.edu. (Study #: 07-0233)

How to get paid

After completing all of the questions on this notecard, search for Uskala Hidayat in the SL search engine and simply drag the notecard from your inventory into anywhere on the right-hand side of my profile. I will inspect the survey for completeness. If all questions have been answered, I will then pay you \$100L. If the survey is incomplete, I will send it back to you with a note about the questions that still need to be done. Only complete surveys will be paid.

Please do not IM your friends to ask Terra about becoming members of "Terra's Nude Heaven." The only avatars who will be paid are those who were members prior to January 15, 2007.

Questions about you:

On average, how many hours per day do you spend in Second Life?

<1; 1 – 2; 2 – 4; 4 – 7; > 7

On average, how many hours per day do you spend at Terra's Nude Heaven?

<1; 1 – 2; 2 – 4; 4 – 7; > 7

First Life Age

18 – 23; 23 – 28; 28 – 33; 33 – 38; 38 – 45; 45 – 55; > 55

First Life Gender

Male; Female

First Life Education Completed

High School; 2 year/associate's degree; 4 year/bachelor's degree; graduate degree

First Life geographical residence (country only)

Membership in Second Life:

Basic, premium

Questions about your experiences in Second Life:

Avatar Name

Avatar Gender

Male; female; indeterminate

How many alternate avatars do you have?

Are the alternate avatars members of Terra's Nude Heaven?

If yes, have any of those alternate avatars taken this survey?

If yes, name(s) of the alternate avatars who have taken this survey.

Avatar sexual orientation

Hetero; gay; lesbian; bi-sexual; prefer not to say

Is your avatar a furry or other non-human entity?

How many friends on your friends list?

Do you display a First Life photograph of yourself in your Second Life profile?

Do you use the Second Life search function to find information?

If yes, how many times per session, on average?

1 – 5; 5 – 10; > 10

How do you find information in Second Life? (Select all that apply.)

Search function

Friends

Asking other avatars

Overhearing avatar conversations

Reading notecards

Sources of information outside of Second Life

Second Life Blogs or newspapers

Mentors

Greeters

Fill in the blank _____

Of these, which are your three most favorite?

Check any of the following activities you engage in at Terra's Nude Heaven:

Drum Circle

Shop at Vendor

Skydive

Sit at bar

Mud wrestle

Lie on float

Sit in beach chair

Shower

Hot tub

Dance balls

Cuddle balls

Sex balls

Water slide

Massage

Visit private room

Visit sky box

Of these, which are your three most favorite?

Keyword Generation Instrument

The rest of the questionnaire will ask you to rate the quality of and/or generate keywords that pertain to Terra's Nude Heaven and Beach. These keywords focus on the objects and activities at this place or just describe it more generally.

Objects

Place a number beside each word indicating how important you think that word is in describing Terra's Nude Heaven and Beach.

5 = very important

4 = somewhat important

3 = neutral

2 = not very important

1 = not at all important

Tub _____
 Bar _____
 Shower _____
 Penis _____
 Parachute _____
 Float _____
 Lounge _____
 Drum _____
 Pose-balls _____
 Beach _____
 Hookah _____
 Ducks _____
 Pond _____
 Shoppe _____
 Garden _____
 Toys _____
 Ladies _____

Of these words, what are the three most important in your opinion?

Please add any words you that you think should be included in a list of objects at Terra's Nude Heaven and Beach.

Activities

Place a number beside each word indicating how important you think that word is in describing Terra's Nude Heaven and Beach.

5 = very important

4 = somewhat important

3 = neutral

2 = not very important

1 = not at all important

Dance _____

Sex _____

Recline _____
 Sunbathe _____
 Wrestle _____
 Cuddle _____
 Meditate _____
 Drum _____
 Drink _____
 Skydive _____
 Shopping _____
 Date _____
 Music _____
 Massage _____
 Games _____
 Party _____
 Conversation _____
 Shower _____
 Kiss _____

Of these words, what are the three most important in your opinion?

Please add any words you that you think should be included in a list of activities at Terra's Nude Heaven and Beach.

Descriptors

Place a number beside each word indicating how important you think that word is in describing Terra's Nude Heaven and Beach.

5 = very important

4 = somewhat important

3 = neutral

2 = not very important

1 = not at all important

Friendly _____
 Sexy _____
 Nude _____
 Erotic _____
 Adventurous _____
 Romantic _____
 BDSM _____
 Clothing-optional _____

Naturist _____
Stimulating _____
Fun _____
Connecting _____
Safe _____
Spontaneous _____
Humorous _____
Funny _____
Loving _____
Relaxing _____
Arousing _____
Heavenly _____
Newbie _____

Of these words, what are the three most important in your opinion?

Please add any words you that you think should be included in a list of descriptors at Terra's Nude Heaven and Beach.

Remember, you can return this questionnaire by searching for Uskala Hidayat in the SL search engine and simply dragging the notecard from your inventory into anywhere on the right-hand side of my profile.

Thank you very much for completing this questionnaire. I hope that the results of my research will be used to make Second Life a better experience for all residents.

Appendix B: Avatar Reminder (from Institutional Review Board modification request)

In order to increase questionnaire response rate, I will sit down in a chair at Terra's Nude Heaven and remind avatars I see who have not returned the questionnaire that doing so would be helpful. I may also ask if they ran into any difficulties returning the questionnaire to me. A possible dialogue would take the following form:

Uskala (me): Hello, [avatar's first name].

Avatar: Hi, Uskala.

Uskala: I notice that you have not returned the questionnaire I sent out last week.

Avatar: Yes, I couldn't figure out how to send it to you.

Uskala: Well, if you still have it in your inventory. You can simply drag it to my name tag now.

Avatar: Oh, I never realized that. That's easy. Here, I'll do it right now.

Uskala: Thanks, the information in your questionnaire will be very helpful and held in strictest privacy.

If the avatar chooses not to respond to my greeting or the comment about not returning the questionnaire, no further communications will be attempted. The avatar will not be followed or harassed in any way.